

## Introduction to Statistics and Data Analysis

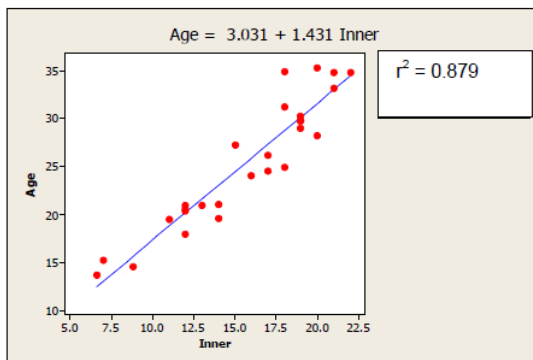
### Regression

The determination of gestational age is important for pregnancy evaluation. The most reliable method of estimating gestational age is the date of the last menstrual period. Ultrasonography offers a unique opportunity in estimating gestational age since this allows direct visualization of the fetus.

Data were collected on 27 normal pregnant women during routine obstetrical ultrasound examinations. The variables recorded were:

1. menstrual age of the fetus (weeks since last menstrual period),
2. inner orbital diameter (mm), and
3. outer orbital diameter (mm),

where the inner orbital diameter is the distance between the inner (medial) borders of the optical orbits, and the outer diameter is the distance between the outer (lateral) borders.



A. Describe the scatterplot.

- B. The regression line is given above the scatterplot. The slope of the line is \_\_\_\_\_. This indicates that for every one mm increase in Inner Orbital Diameter, we expect Menstrual Age to increase/decrease (circle one) by \_\_\_\_\_ weeks, on average.
- C. The  $r^2$  value is given next to the scatterplot. The value of  $r^2$  is \_\_\_\_\_. This indicates that \_\_\_\_\_% of the variability in \_\_\_\_\_ is explained by the linear relationship with \_\_\_\_\_.
- D. Use the value of  $r^2$  to obtain the value of  $r$ . Be sure to give the correct sign (positive or negative) to  $r$ . What is the value of the  $r$  for this data? \_\_\_\_\_
- E. What Menstrual Age would you predict for a fetus with in Inner Orbital Diameter of 16 mm?
- F. There was one fetus in the sample with an inner orbital diameter of 16 mm. The menstrual age of this fetus was 24.1 weeks. Compute the error of your prediction in part E by taking the actual menstrual age and subtracting your prediction.

Here is the data for Outer  
Orbital Diameter and  
Menstrual Age.

1. Enter the values into two  
lists in your calculator.

Outer	Age
16	13.7
20	14.6
23	15.3
29	18.0
31	19.6
31	19.7
30	20.4
33	20.6
33	21.0
36	21.0
34	21.1
43	24.1
38	24.6
45	25.0
38	26.3
45	27.3
48	28.3
46	29.1
52	29.9
52	29.9
45	30.4
47	31.3
50	33.3
50	34.9
54	34.9
51	35.0
52	35.4

2. Obtain a scatterplot and describe the graph.

3. Perform a regression on your calculator with Outer as  
the X variable and Age as the Y variable.

What is the equation of your regression line?

\_\_\_\_\_

What is the value of  $r^2$ ? \_\_\_\_\_

What is the value of  $r$ ? \_\_\_\_\_

4. What does the value of the slope indicate? (Write a  
sentence similar to the one in part C).

5. What does the value of  $r^2$  indicate? (Write a sentence  
similar to the one in part D).

6. Which regression is “better”, the one using Inner as the  
explanatory variable or the one using Outer? EXPLAIN.